

UNIVERSITY OF CALIFORNIA

An Economic-Statistical Analysis of Egg Prices Paid by Retailers in the San Francisco Bay Area, 1952-1955

James N. Boles and Richard Simmons

CALIFORNIA AGRICULTURAL EXPERIMENT STATION GIANNINI FOUNDATION OF AGRICULTURAL ECONOMICS

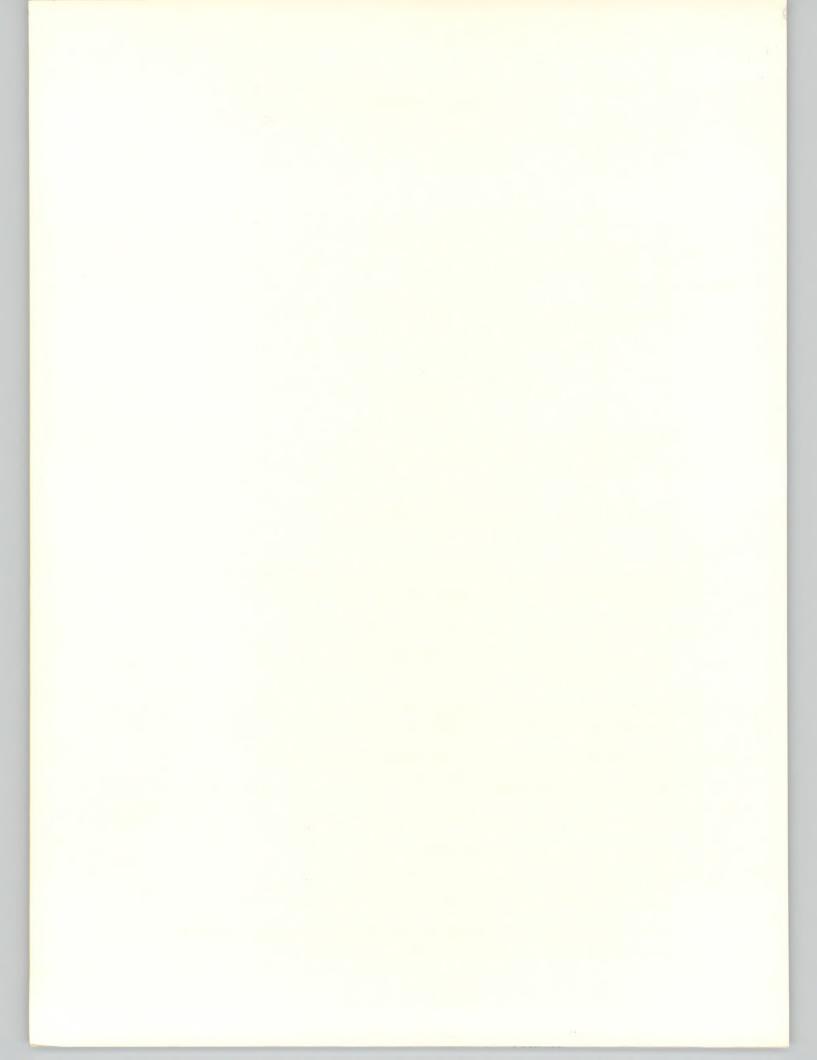


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AN ECONOMIC-STATISTICAL ANALYSIS OF EGG PRICES PAID BY RETAILERS IN THE SAN FRANCISCO BAY AREA, 1952-1955

by

James N. Boles and Richard Simmons 2/

Introduction

The objective of this study is to quantify the relationships between prices paid by retailers and quantities sold of the various sizes and grades of eggs in the San Francisco Bay area consisting of Marin, San Francisco, San Mateo, Contra Costa, and Alameda counties.

As is usually the case in economic analyses, the data that are easily available do not measure precisely the economic quantities of interest. The prices used are not average prices for all egg sales but are those quoted by the San Francisco office of the Poultry Producers of Central California (PPCC), a producers' cooperative and the largest egg handler in the San Francisco Bay area. These prices refer to cartoned eggs delivered to the retail stores. Stores handling more than five cases weekly received a 2-cent-per-dozen discount.

These prices are administered prices selected by the management of PPCC after careful consideration of market conditions. As a consequence, they tend to be more stable over time than would be true for, say, auction prices. For example, in 1955, the quoted price paid by retailers for Large AA eggs remained at 52 cents per dozen from May 23-July 11. Subsequent analysis will make clear, however, that even administered prices are influenced greatly by economic forces.

Daily prices were obtained for the years 1952 through 1955 for some 14 categories. However, only prices for the four most important retail categories--Large AA, Large A, Medium A, and Small A--are used. These grades comprised some 90 per cent of total sales reported.

^{1/} Assistant Professor of Agricultural Economics and Assistant Agricultural Economist in the Experiment Station and on the Giannini Foundation.

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Even though prices were obtained from only one source, there is a strong presumption that these prices are representative of the entire market. The same cannot be said for the sales data. Weekly sales by size and grade were obtained from only two companies--PPCC and Brentwood--that handled together about 42 per cent of total egg sales in the Bay area. There is an implicit assumption in much of what follows that the combined market share of these two companies has at least remained approximately constant during the interval for which data were collected. 2

PPCC operates in an area extending in a narrow strip up and down the northern California coast from Eureka to Monterey with a bulge around the San Francisco Bay area extending well into the San Joaquin Valley. It is not surprising that exact sales data could not be found that coincided with the geographic area specified above—the five Bay area counties. Approximately 15 branch offices submitted data on weekly sales by size and grade to the main office in San Francisco. Weekly sales from three offices were selected and used—San Francisco, Oakland, and Hayward. In 1953 these three offices handled about 60 per cent of PPCC egg sales. The San Francisco office served the entire West

^{1/} The estimate of 42 per cent was made in the following way:

⁽a) Total reported sales for thirteen 28-day periods in 1955 were computed from the data in Appendix Table A-1, 26.372 million dozen eggs.

⁽b) This total was multiplied by 12 eggs per dozen and divided by the 1955 total population in the San Francisco Bay area, Appendix Table A-3, 2.441 million persons, to obtain per-capita sales, 136.5 eggs per person.

⁽c) This figure was then divided by an estimate of California per-capita consumption in 1955, 362 eggs per person, derived by Dr. Stanley Seaver in an unpublished manuscript analyzing the California egg market. The ratio obtained corresponds to 37.7 per cent of California per-capita consumption. Since only six retail categories comprising some 90 per cent of sales were included, total sales of PPCC and Brentwood in the San Francisco Bay area were estimated to be 42 per cent--37.7 divided by 0.9.

^{2/} A similar procedure as described in footnote 1 was used for 1952, resulting in an estimate of 45 per cent. This result lends support to this implicit assumption that the combined market share of PPCC and Brentwood was relatively constant during the period of analysis.

^{3/} Tinley, J. M., and H. E. Erdman, Operating Problems of a Cooperative Poultry and Feed Association (Berkeley: 1957), Table 9, p. 41 (California Agricultural Experiment Station Bul. 759.)

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Bay from San Rafael to Palo Alto. The Cakland office served the East Bay from Vallejo to San Leandro. The Hayward office served the lower part of the East Bay. No adjustment was required for sales from the Oakland and Hayward offices. Overseas shipments, however, were included in San Francisco sales. Daily invoices were used to compile weekly overseas shipments by size and grade, and these were subtracted from San Francisco weekly sales to obtain net local sales. The invoices for November, 1953, were lost and no data were available for this period. Weekly sales for the four most important categories listed above were recorded. One minor modification was made. Sales of Jumbo A and Extra Large A--relatively insignificant categories--were included in Large A sales.

Brentwood, distributing eggs to Safeway, recorded sales in much the same way as PPCC by weeks and by size and grade. The sales week was the same as that used by PPCC. Sales from individual routes were recorded separately. Some routes, serving primarily stores outside the Bay area, were excluded even though they also distributed eggs to a few Bay area stores. The alternative procedure was to sort through daily sales slips to obtain sales for the few stores erroneously excluded. The substantial additional work was not believed to be warranted. Sales records were not available for the period prior to April, 1952.

During the period studied, there were significant inshipments of eggs into California. For example, in 1955 more than 1,500,000 cases of eggs were imported from other states--largely from the Midwest. Consequently, a price series was selected to represent midwestern eggs. Chicago average monthly wholesale prices of large extras, 60 per cent A's or better, were used for comparison with local prices. 1

The weekly data were aggregated into 28-day periods. An unweighted 28-day average price was computed for each period for each of the four categories-Large AA, Large A, Medium A, and Small A. The largest single category omitted was commercial eggs, a grade that was not handled by a large majority of retail stores. Of the four grades used, Large AA averaged 57 per cent, Large A averaged 15 per cent, Medium A averaged 24 per cent, and Small A, about 4 per cent of egg sales of the two companies from which sales data were obtained. These proportions, of course, vary seasonally.

^{1/} See Appendix Table A-4.

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Qualitative Analysis

In order to detect trends, marked patterns of variation, and relationships between series, the various time series were graphed.

It is clear from Figure 1 that Large AA prices tend to be high in the fall months and somewhat lower in the spring. During the periods when Large AA prices are high, the spread between Large AA and Small A tends to be substantially increased.

These tendencies are even more clearly revealed in Figure 2 where price ratios are plotted. The price ratio of Large A to Large AA shows no particular pattern of variation, while the ratios of Medium A to Large AA and Small A to Large AA exhibit a similar and marked seasonal variation.

Sales by size and grade are graphed in Figure 3. The sale of large eggs is heaviest in the winter and spring months, while the sale of small eggs is relatively greater in the fall. This seasonal pattern arises from the practice of starting chicks in the spring to replace older hens in the fall. A comparison of Figures 1 and 3 indicates that the prices for Large AA are inversely related to sales of Large AA-high prices are associated with relatively small quantities. On the other hand, wide margins between Large AA and Small A prices are associated with relatively large quantities of Small A eggs.

Figure 4 illustrates sales ratios and further substantiates these relationships.

The Economic Model

The qualitative and graphic analysis suggests that the prices and quantities of the several egg categories are closely interrelated. The relative uniformity of the ratio between Large AA and Large A prices and their similar seasonal patterns further suggest that these two categories can be reasonably combined into a single "large" category. For parallel reasons medium and small eggs are combined into a single "small" category.

Prior to statistical analysis, it is necessary to specify the principal economic characteristics of the San Francisco Bay area egg market.

At prices prevailing during the period studied, local production of large eggs was not adequate to supply the quantity of eggs demanded. Eggs were shipped in--largely from the Midwest--to make up the deficit. This suggests that, on the average, the local price of large eggs was just high enough to

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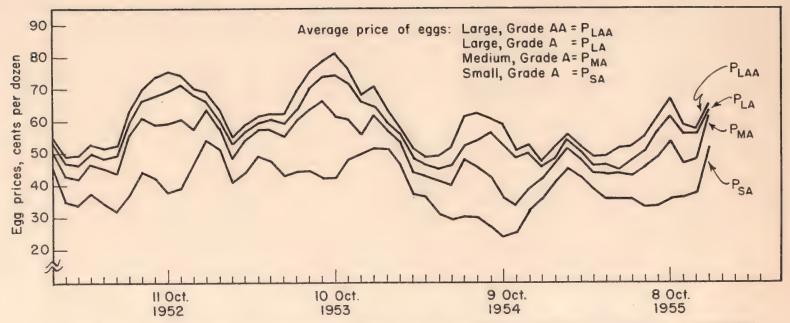


Figure 1. Twenty-Eight-Day Average Egg Prices, by Size and Grade, San Francisco Bay Area, 1952-1955 Source: Appendix Table A-1.

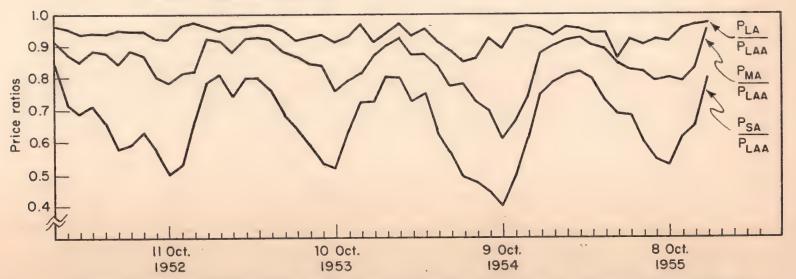


Figure 2. Ratios of 28-Day Average Egg Prices, by Size and Grade, San Francisco Bay Area, 1952-1955 Source: Appendix Table A-8.



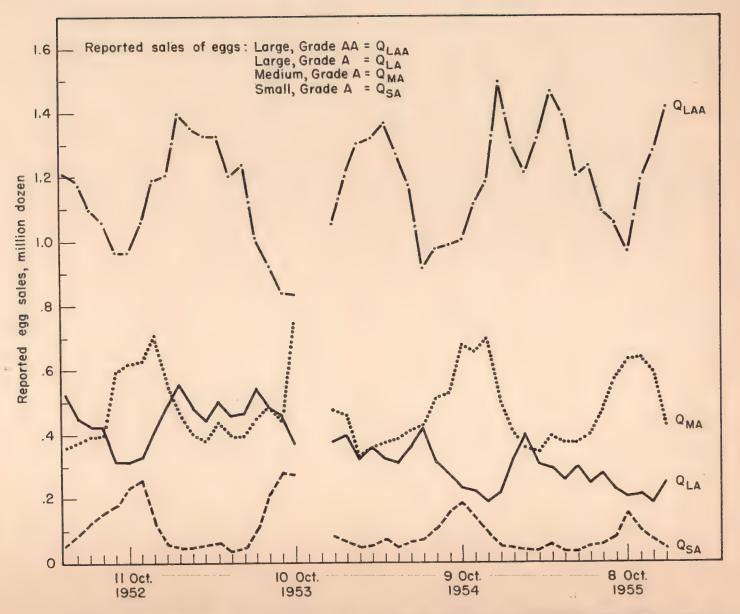


Figure 3. Reported Egg Sales, 28-Day Totals, by Size and Grade, San Francisco Bay Area, 1952-1955 Source: Appendix Table A-1.



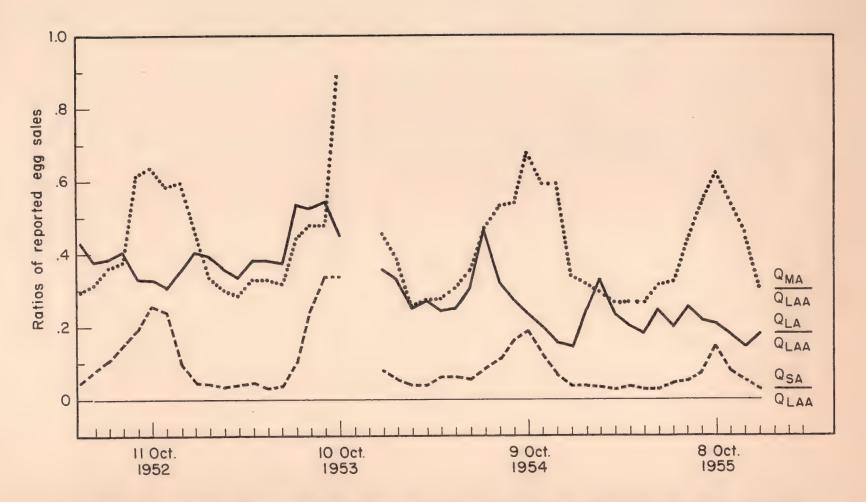


Figure 4. Ratios of Reported Egg Sales, by Size and Grade, San Francisco Bay Area, 1952-1955 Source: Appendix Table A-9.



make inshipments attractive. A higher price would have attracted greater imports and created an excess supply. A lower price, on the other hand, would have reduced imports and caused an inadequate supply. Consequently, the principal determinant of local large egg prices was the level of large egg prices in the exporting region--the Midwest.

Small eggs are not likely to be shipped in from the Midwest. Consequently, the local supply of small eggs is largely determined by flock replacement policies. Local sales of small eggs, however, may not coincide with local production. During periods of peak production of small eggs, the local price may be sufficiently low to induce shipment to other regions. It is assumed in subsequent analysis that the quantities of such exports are of minor importance. Under these conditions the major determinants of the price of small eggs are:

(1) the price of large eggs since these are close substitutes for most consumers and (2) the quantity of small eggs produced (and sold). In other words, small egg prices are likely to be set to clear the market. Over time, variation in population and per-capita income is also likely to affect the level of price that will clear the market of small eggs.

Large egg sales are made up of local production plus imports from other United States egg-producing regions. The major determinants of large egg sales are: (1) the price of large eggs, (2) the price of small eggs, (3) population, and (4) consumer income.

To summarize, the quantity of small eggs available in a given season is predetermined by flock replacement policies of egg producers. The price of large eggs is determined by the price of Midwest eggs and the cost of transfer to San Francisco. Given the price of large eggs, the price of small eggs is set to clear the market. Finally, the quantity of large eggs sold during a particular period depends on the prices of both large and small eggs and on consumer income.

Statistical Results

In a sense, the economic model presented in the previous section represents a tentative and generalized hypothesis as to the operation of the San Francisco Bay area egg market. The next step is to test this hypothesis empirically and, at the same time, to quantify the indicated relationships. Technical details of data preparation and statistical procedures are found in the Appendix, page 19.

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The first estimating equation quantifies the relationship between the price of large eggs in San Francisco and the price of large eggs in Chicago. 1/2 Estimated values of the San Francisco price of large eggs, P_{Lt} , are obtained by inserting the corresponding Chicago prices, P_{Ct} , into the equation:

(1)
$$P_{Lt} = 14.476 + 0.991 P_{Ct}$$
.

The constant term, 14.476 cents per dozen, indicates that San Francisco large egg prices were, on the average, about 14 cents per dozen higher than Chicago prices. This differential between San Francisco and Chicago large egg prices is considerably greater than the cost of transfer. However, it includes at least the following additional major components: (1) a 2-cent discount to larger stores, (2) cost of delivery to retail stores, (3) cost of processing, and (4) an allowance for difference in grade. A detailed analysis of each of these components is outside the scope of the present study.

The coefficient associated with P_{Ct}, 0.991, indicates that a 1-cent change in the Chicago price has been associated with approximately a 1-cent change in the same direction in the local price of large eggs. The relationship between San Francisco and Chicago large egg prices is illustrated by Figure 5. Equation 1 is used to estimate local large egg prices. A comparison between these estimated and actual prices is made in Figure 6. The average difference is 2.98 cents per dozen. 2/

The second estimating equation quantifies the relationship between the local price of small eggs, the local price of large eggs, and the quantity of small eggs to be sold in the subsequent time period. The local price of small eggs, P_{St} , is estimated by inserting the corresponding values of the local price of large eggs, P_{Lt} , and the local per-capita sales of small eggs in the following time period, Q_{S} , t+1, into the equation:

(2)
$$P_{St} = 2.639 + 1.050 P_{Lt} - 65.394 Q_{S, t+1}$$

^{1/} The data actually used in deriving the following equations are found in Appendix Table A-6. The estimating equations are listed in Appendix Table A-7.

^{2/} The figure cited is a quadratic average usually designated as the standard error of estimate.

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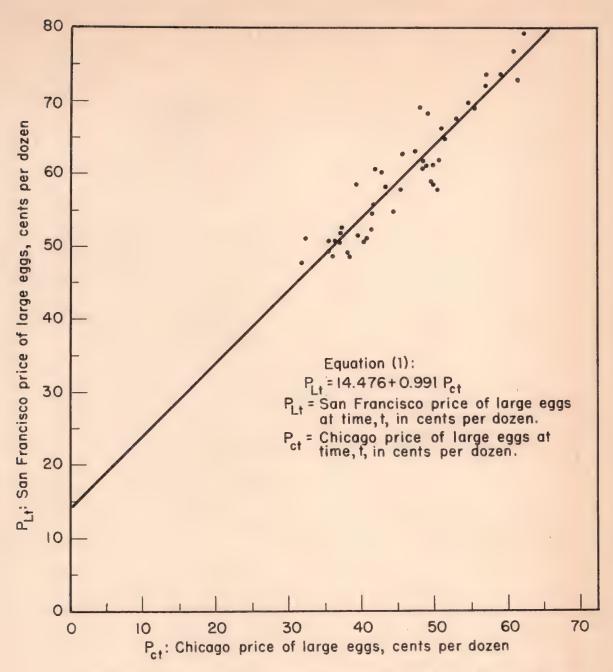
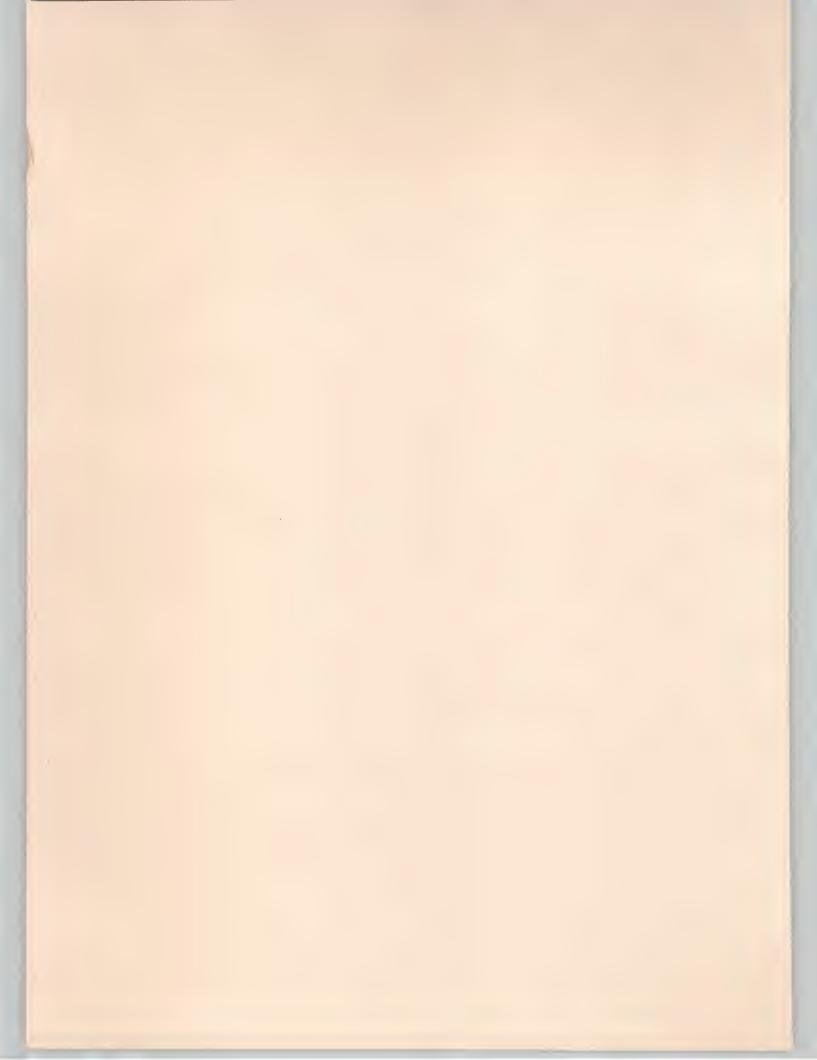


Figure 5. Average Relationship Between the Price of Large Eggs in the San Francisco Bay Area and in Chicago



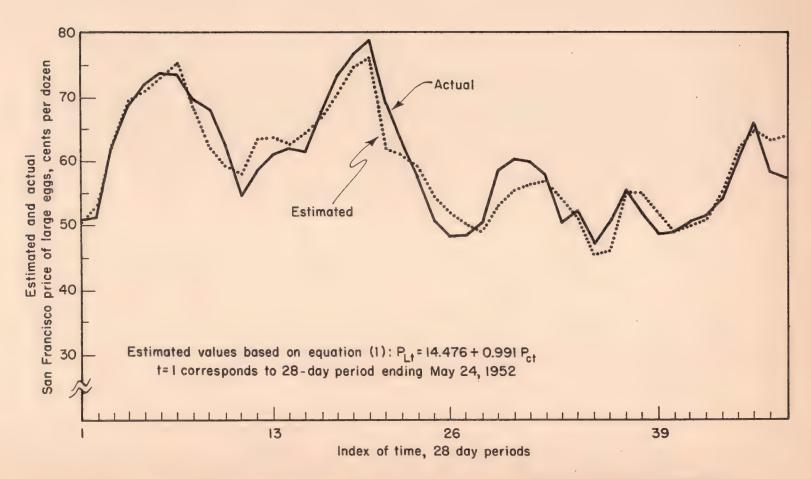


Figure 6. Estimated and Actual Prices of Large Eggs, San Francisco Bay Area, 1952-1955



This equation indicates that the price of small eggs varies directly with the price of large eggs in the same time period and inversely with per-capita sales of small eggs sold in the following time period. The use of per-capita small egg sales in the following time period rather than the same time period as the small egg price was suggested by the data. In a subsequent conversation with an officer of the PPCC, it was stated that prices of small eggs were adjusted in anticipation of changes in their supply. The coefficient associated with the local price of large eggs, 1.150, indicates that for a fixed quantity of small eggs the price of small eggs increases somewhat more rapidly than the price of large eggs. In other words, for a fixed quantity of small eggs, the spread between large and small egg prices is likely to be slightly narrower when the price of large eggs is high.

Equation (2) is illustrated in Figures 7 and 8. Figure 7 shows the estimated relationship between the price of small eggs and per-capita sales of small eggs when the price of large eggs is set equal to its average value during the period being analyzed. Figure 8 shows the estimated relationship between the price of small eggs and the price of large eggs when per-capita sales of small eggs is fixed at the average. The average difference between actual and estimated values of local small egg prices, P_{St}, is 2.87 cents per dozen. 1/2

The third estimating equation quantifies the relationship between percapita sales of large eggs in the San Francisco Bay area and the local price of large eggs, the local price of small eggs, and per-capita income and time. Local per-capita sales of large eggs are estimated by inserting in the following equation the local price of large eggs, PLt; the local price of small eggs, Pst; per-capita income, Yt; and time, Tt, where Tl = 1 for the 28-day period ending May 24, 1952:

(3)
$$Q_{Lt} = 0.837 - 0.013 P_{Lt} + 0.011 P_{St} + 0.000748 Y_t - 0.00346 T_t$$

The algebraic signs of the coefficients of equation (3) indicate that percapita sales of large eggs vary directly with the price of small eggs and percapita income and vary inversely with the price of large eggs and time. The coefficient of time, T_t, indicates that per-capita sales of large eggs by the two companies represented declined on the average 0.00346 dozens per person

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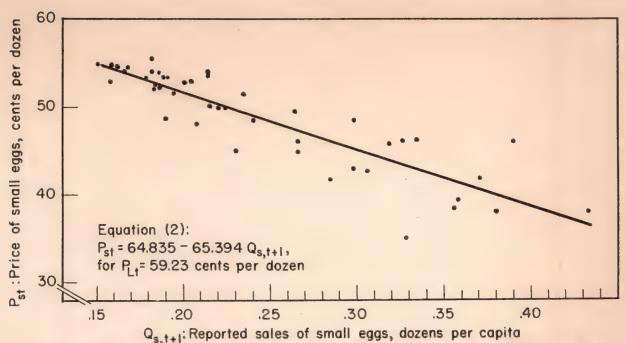


Figure 7. Average Net Relationship Between the Price of Small Eggs and Reported Per Capita Sales of Small Eggs in the Following Time Period

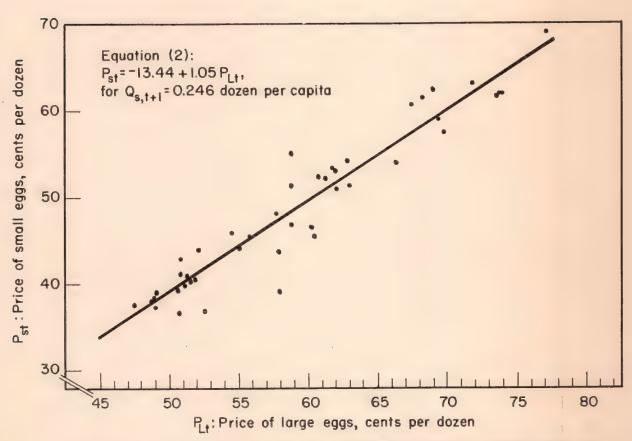


Figure 8. Average Net Relationship Between the Price of Small Eggs and the Price of Large Eggs



during the period analyzed. Although this trend might indicate only a declining proportion of total per-capita large egg sales by the two companies, a similar down trend has been noted for the total California as well as the national egg market.

The coefficient in equation (3) associated with per-capita income was found not to be statistically significant. Consequently, a second estimating equation, (3'), excluding per-capita income, was fitted to the data.

(3')
$$Q_{Lt} = 0.944 - 0.013 P_{Lt} + 0.011 P_{St} - 0.00329 T_t$$

Figures 9 through 11 illustrate the net relationship between per-capita sales of large eggs and the price of large eggs, the price of small eggs, and time.

Percentage Relationships

The coefficients of the three estimating equations indicate the net effect on the estimated variable of a unit change of an explanatory variable if all the other explanatory variables were unchanged. Thus, the coefficient of P_{Lt} in equation (3'), -0.013, indicates that an increase in the price of large eggs of 1 cent per dozen has been associated with an average net decrease in percapita large egg sales of 0.013 dozens per person. This number, of course, depends on the units of measurement and the proportion of total sales handled by the two companies represented. Providing only that the proportion of San Francisco Bay area sales handled by the two companies was reasonably constant during the period of analysis, it is possible to derive certain relationships that are independent of the units of measurement and that are also appropriate for the total market.

The first relationship is that between per-capita sales and income. Even though the coefficient associated with income was not statistically significant, it affords the only evidence based on these data that is available. With each of the other explanatory variables fixed at its average value, a 10-per cent increase (decrease) in per-capita income was associated with a 2.0-per cent increase (decrease) in per-capita sales of large eggs.

Similarly, with each of the other explanatory variables fixed at its average value, a 10-per cent increase (decrease) in the price of large eggs was associated with an average 13.5-per cent decrease (increase) in per-capita sales. A 10-per cent increase (decrease) in the price of small eggs was associated with an average 8.6-per cent increase (decrease) in per-capita sales of large eggs.

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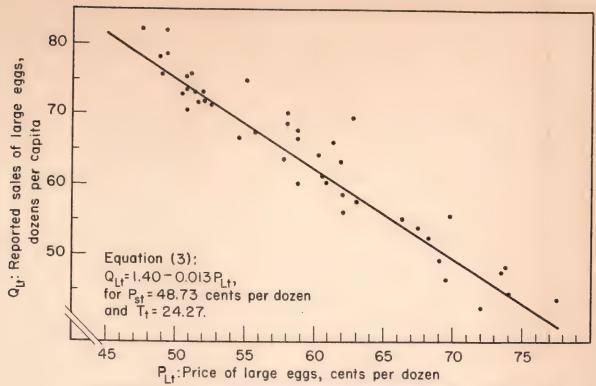


Figure 9. Average Net Relationship Between Per Capita Sales of Large Eggs and Price of Large Eggs

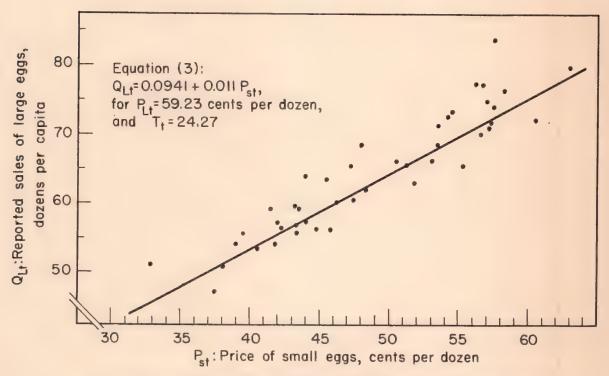
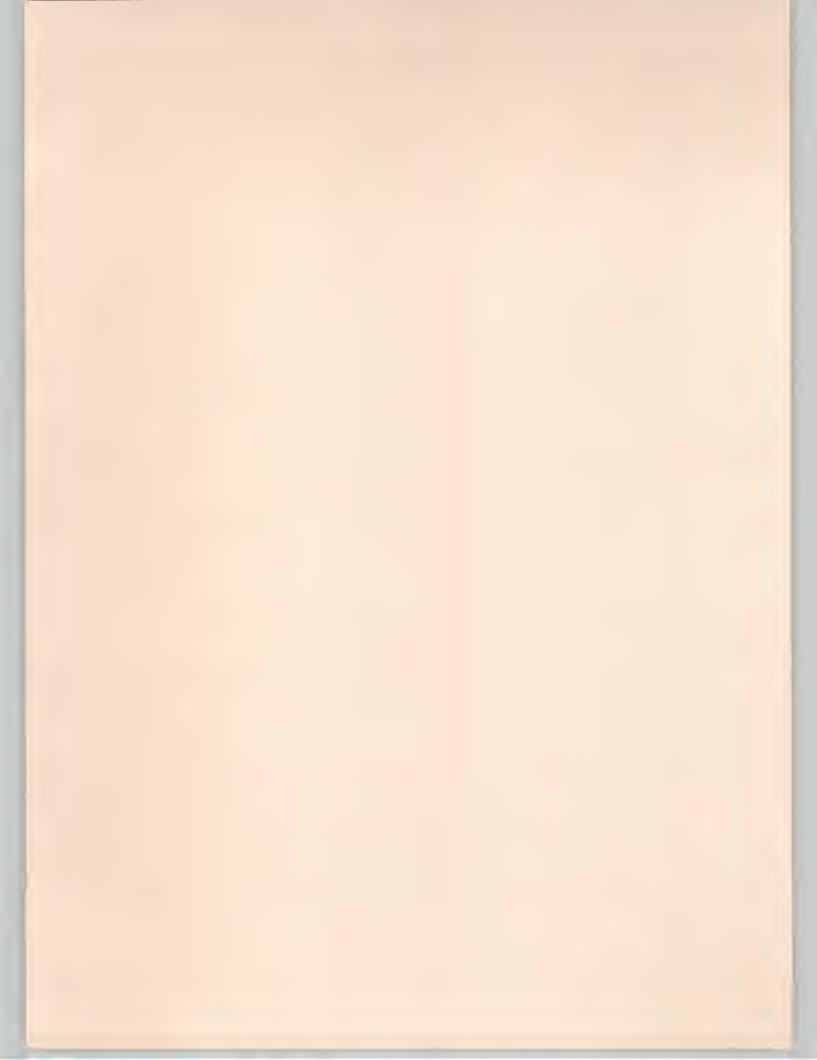


Figure 10. Average Net Relationship Between Per Capita Sales of Large Eggs and Price of Small Eggs



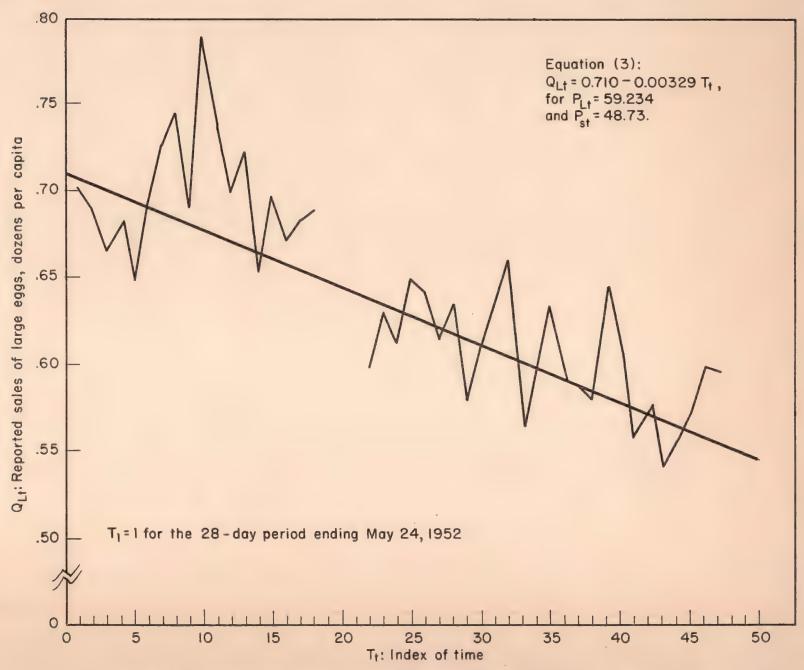


Figure 11. Average Net Relationship Between Per Capita Sales of Large Eggs and Time



Two percentage relationships are derived from equation (2). A 10-per cent increase (decrease) in per-capita sales of small eggs was associated with an average of 3.3-per cent decrease (increase) in the price of small eggs. A 10-per cent increase (decrease) in the price of large eggs was associated with an average 12.8-per cent increase in the price of small eggs.

Physical rates of exchange were also available from the fitted equations. The line of causation would be as follows: (1) an increase in the sales of small eggs would only be possible with a reduced price of small eggs and (2) the increased price spread would induce some consumers to reduce their consumption of large eggs. Presumably, the local price of large eggs, determined largely by the Midwest price, would not vary. The fitted equations imply that the rate of exchange is 1 dozen of small eggs for .75 dozen of large eggs. This may be compared with the minimum weights for one dozen large eggs and one dozen medium eggs, 24 and 21 ounces, respectively. A more accurate comparison would require an average minimum weight for medium and small eggs—the two sizes included in the "small" category. The computed rate of exchange implied a slight expansion in the weight of eggs consumed per capita as the quantity of small eggs consumed is increased.

Summary

Except for minor modifications, the statistical results are consistent with the tentative and generalized hypothesis previously formulated as to the operation of the San Francisco Bay area egg market. It is clear that, even though the prices analyzed are administered prices, they are closely related to and influenced by the same economic variables that would influence free market prices. Without a detailed analysis of each of the components that contribute to the average differential that has existed between San Francisco and Chicago large egg prices, it is not possible to say whether San Francisco prices have been higher or lower than would have been the case with free market prices. It is likely, however, that free market price relationships represent the minimum differential that can be sustained over time and that, if there has been any deviation, it has been in the direction of a larger differential and, thus, a higher average level of San Francisco prices.

The minor modifications referred to are:

(a) The use of the quantity of small eggs in the following time period to influence price in the current time period.

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(a) the use of the quantity of small egys in the following the serious of the order time policies.

- (b) The finding in equation (3) that for this relatively short time period consumer income was not an important variable in the determination of per-capita sales of large eggs.
- (c) The finding in equation (3) and (3') that there has been a significant down trend in per-capita sales of large eggs.

It should be emphasized that the sales data refer only to the combined sales of PPCC and Brentwood. The derived equations, however, can be modified to reflect total sales if the sales of these two companies were a constant proportion of total sales and if the actual proportion were known. On the basis of rather tenuous evidence, it was estimated that in 1955 the combined share of PPCC and Brentwood was 42 per cent of the total market. Defining R_{Lt} and R_S, t+1 to represent total per-capita sales of large and small eggs in the San Francisco Bay area market:

$$Q_{Lt} = 0.42 R_{Lt}$$
, and $Q_{S, t+1} = 0.42 R_{S, t+1}$

Equation (1) is unaffected by this change. Inserting these relationships into equations (2) and (3'), the following equations are derived:

(2)
$$P_{St} = 2.639 + 1.050 P_{Lt} - 27.465 R_{S, t+1}$$

(3')
$$R_{Lt} = 2.248 - 0.031 P_{Lt} + 0.026 P_{St} - 0.00783 T_t$$

It should also be emphasized that, during the period of analysis, California and presumably the San Francisco Bay area were continually receiving eggs from the Midwest. This fact accounts for the relationship between San Francisco and Chicago large egg prices. There has been in recent years, however, a tendency for California egg production to increase more rapidly than California consumption. If this trend continued to the point where California is producing a surplus of large eggs that must find a market elsewhere, it is almost certain the differential will be reduced.

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Appendix

Data Preparation

It was not possible to find estimates of per-capita personal income for the San Francisco Bay area. The variable selected as an indicator of changes in personal income was California per-capita income based on quarterly estimates of personal income and annual estimates of population prepared by the California Department of Finance. Monthly estimates of California population were obtained by linear interpolation between the annual estimates (see Appendix Tables A-2 and A-3).

Annual population estimates for the five counties of the San Francisco Bay area were aggregated and linear interpolations calculated. These monthly estimates of population were then used to convert the sales data to per-capita sales.

The Chicago prices were monthly averages. Prices in adjacent months were weighted by the number of days in common with each 28-day period, and a new series was computed.

All of the data used in the regression analyses are listed in Appendix Table A-6.

The Statistical Model

The economic considerations discussed in the text suggested the following specification of a statistical model, a set of equations that simultaneously generate the interrelated endogenous economic variables, the price of large eggs, the price of small eggs, and the quantity of large eggs sold. Minor modifications were suggested by preliminary analysis of the data. The four exogenous variables are the price of large eggs in Chicago, the quantity of small eggs produced (and sold), consumer income, and time.

The set of equations used are as follows:

$$a_{11} P_{Lt} + a_{14} P_{Ct} = u_{1t}$$
 (1)

$$a_{21}$$
 $P_{Lt} + a_{22}$ $P_{St} + a_{25}$ Q_{S} , $t+1 = u_{2t}$ (2)

$$a_{31} P_{Lt} + a_{32} P_{St} + a_{33} Q_{Lt} + a_{36} T_t + a_{37} Y_t = u_{3t}$$
 (3)

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$$a_1 P_{CC} = a_{DC} = a_{DC} \tag{1}$$

P_{Lt} = local price of large eggs at time, t.

P_{St} = local price of small eggs at time, t.

Q_{Lt} = local per-capita sales of large eggs at time, t.

P_{Ct} = Chicago price of large eggs at time, t.

 $Q_{S, t+1} = local per-capita sales of small eggs at time, t+1.$

T_t = index of time.

Y_t = local per-capita income at time, t.

 $u_{it} = random \ variables, i = 1, 2, and 3.$

In the system of equations, there are three endogenous variables, P_{Lt} , P_{St} , and Q_{Lt} ; three exogenous variables, P_{Ct} , T_t , and Y_t ; and one predetermined variable here treated as an exogenous variable, $Q_{S, t+1}$. Notice that the set of equations form a recursive system. Only one endogenous variable, P_{Lt} , appears in the first equation. Each successive equation introduces one additional endogenous variable.

For recursive systems of this kind, two rather simple computational procedures are available depending upon the specification of the statistical properties of the three sets of random variables. If the three random variables at time, t, are statistically independent, then each separate equation of the recursive system can be estimated using the least-squares procedure. If the three random variables at time, t, are not statistically independent, then the first equation can be estimated using least squares; and then the calculated values of the endogenous variable in the first equation is used as an independent variable in the second equation and the least-squares procedure used once again. Calculated values of the first two endogenous variables are then inserted in the third equation, and the least-squares procedure is applied once more.

Only the first procedure was completed--each equation was fitted separately by least squares. However, the second procedure was also followed for the first two equations. At least some intuitive support for separate least-squares fitting was obtained when it was noted that in both cases the correlation between residuals of the two fitted equations was not significantly different from zero.

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APPENDIX TABLE A-1

Egg Sales and Average Prices Paid by Retailers During 28-Day Periods

By Size and Grade, San Francisco Bay Area

28-day period		28-day sale by grade a	s of eggs		28- re	-day average tailers by gr	price paid by ade and sizeb	1
ending	Large AA	Large A	Medium A	Small A	Large AA	Large A	Medium A	Small A
	1	2	3	4	5	6	7	8
}		million	dozens			cents pe	r dozen	
1952 May 24	1.213	0.522	0.354	0.053	51.8	48.7	45.5	34.5
June 21 July 19 August 16	1.189 1.098 1.055	0.449 0.421 0.424	0.372 0.394 0.398	0.087 0.121 0.153	52.2 63.0 70.0	49.6 59.8 66.4	44.1 56.1	32.1 37.5
September 13 October 11	0.965	0.311	0.591	0.178	73.3 75.4	68.0 69.5	61.3 59.0 59.4	44.4 42.4 38.2
November 8 December 6	1.065	0.328 0.415	0.623	0.255	74.3 70.2	71.7 68.6	60.7 57.8	39.4 46.9
1953 January 3 January 31 February 28 March 28 April 25 May 23 June 20 July 18 August 15 September 12 October 10 November 7	1.206 1.399 1.349 1.329 1.328 1.204 1.237 1.013 0.924 0.841	0.492 0.554 0.484 0.444 0.502 0.457 0.466 0.540 0.485 0.458	0.559 0.469 0.403 0.378 0.436 0.392 0.394 0.448 0.486 0.443	0.057 0.049 0.050 0.052 0.062 0.036 0.046 0.106 0.215 0.281 0.278	69.1 63.6 55.4 59.2 61.8 62.6 62.7 69.6 75.4 78.7 81.2 76.4	66.5 60.3 53.4 57.1 59.8 60.6 59.6 63.7 70.1 73.9 74.5 71.9	63.9 58.0 48.9 54.7 57.4 57.7 55.6 60.4 63.7 66.2 61.8 60.7	54.5 51.7 41.5 44.2 49.7 48.0 43.3 44.8 42.6 42.7 48.4
December 5					68.7	66.6	56.1	50.0

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1955 January 1 January 29 February 26 March 26 April 23 May 21 June 18 July 16 August 13 September 10 October 8 November 5 December 3 December 31	1.494 1.300 1.209 1.318 1.467 1.396 1.198 1.230 1.089 1.053 1.016 1.187 1.281 1.417	0.216 0.322 0.393 0.305 0.296 0.256 0.293 0.244 0.273 0.226 0.206 0.211 0.185 0.248	0.506 0.411 0.354 0.345 0.372 0.372 0.372 0.398 0.472 0.570 0.630 0.633 0.588 0.427	0.052 0.048 0.039 0.036 0.053 0.037 0.035 0.050 0.054 0.075 0.151 0.099 0.067 0.045	47.9 516.5 52.5 49.6 51.2 551.2 551.8 64.8	45.1 46.1 46.1 46.1 46.1 47.0 47.0 48.0 47.0 48.0 49.0	42.1 46.9 51.8 44.0 44.0 44.0 44.0 45.1 46.1 47.1 48.5 61.7	36.0 41.0 45.6 43.6 36.0 36.0 33.9 36.0 33.9 36.0 38.0 52.0

Sources:

Cols. 1-4: From PPCC and Brentwood records. Cols. 5-8: From PPCC records.

a/ Figures are rounded.

D/ Simple average of daily prices.

C/ Dashes indicate no data available.

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APPENDIX TABLE A-2
California Personal Income by Quarters, 1952-1955

Quarter	1952	1953	1954	1955	1954	1955
	1	2	3 million	dollars	5	6
First	5,364	5,915	5,988	6,452	6,377	6,740
Second	5,588	6,111	6,073	6,727	6,498	7,028
Third	5,871	6,222	6,220	6,907	6,529	7,216
Fourth	6,434	6,608	6,669	6,994	6,661	7,307

Sources:

Cols. 1-3:

California Department of Finance, Income Payments in California /1946-1954/ (Sacramento: 1955). Processed. Income payments include: (1) wages and salaries, (2) proprietor's income, (3) property income, and (4) other income.

Col. 4:

In order to obtain a continuous series, the 1954 figures were added for the data under column 3 and column 5; and the ratio of the two totals, 0.95722, was used to multiply the figures for 1955 (column 6).

Cols. 5 and 6:

California Department of Finance, California Personal Income (Sacramento: 1956), pp. 2-3. Processed. The original data was quarterly personal income in California at annual rates. In order to make this series comparable to the above, (1) wage and salary disbursements, (2) other labor income, (3) proprietor's income, and (4) property income were added and divided by 4 to convert into the corresponding quarterly rate.

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APPENDIX TABLE A-3

California and San Francisco Bay Area Population, July 1, 1951-1956

Area	1951	1952	1953	1954	1955	1956
	1	2	millions	of persons	5	6
		1	MILLIONS	or persons		
California	11.058	11.743	12.168	12.595	13.035	13.600
Counties						
Alameda	.758	.793	.808	.842	.853	.862
Contra Costa	.318	-342	•357	.341	·3 ⁴ 3	-346
Marin	.092	.096	.101	.107	.113	.121
San Francisco	.776	.792	.796	.798	.795	.783
San Mateo	.254	.276	.295	.316	•337	-358
San Francisco Bay area	2.198	2.299	2.357	2.404	2.441	2.470

a/ Calculated by summing the five county figures.

Sources:

Cols. 1-4: California Department of Finance, Estimated Population of California's Areas and Counties, 1950-1955 (Sacramento: 1955),
Table 6. Processed.

Col. 5: Ibid., Table 5.

Col. 6: California Department of Finance, Population of California's Areas and Counties in 1957 (Sacramento: 1957), Table 6.

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C.E. 6: Lui or and Counties in 1957 (No. and Tillian 1965) In the State of the Stat

APPENDIX TABLE A-4

Shell Eggs, Average Wholesale Prices of Large Extras at Chicago, by Months, 1952-1955

Month	1952	1953	1954	1955
	1	2	3	4
		cents per	dozen	
January February March April May June July August September October November December	39.77 36.42 38.24 39.56 35.89 40.40 40.40 56.02 63.60 56.04 48.94	45.38 44.34 49.53 49.74 48.56 51.07 53.41 59.15 62.76 61.26 54.32 47.86	47.21 45.02 40.34 38.04 35.49 35.07 41.94 41.57 44.26 40.85 38.11 31.70	33.40 42.17 40.98 37.26 34.63 36.85 37.02 46.36 51.36 49.54 50.11 51.39

a/ Dashes indicate no data available.

Sources:

Col. 1: U. S. Production and Marketing Administration,

Dairy and Poultry Market Statistics, 1952 (Washington, D. C.: 1953), Table 87.

Cols. 2-4: U. S. Agricultural Marketing Service, <u>Dairy and Poultry Market Statistics</u> (Washington, D. C.: annual issues).

The prices used are those listed for large extras (minimum 60-per cent A quality) and are averages of prices for white, brown, and mixed color eggs.

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APPENDIX TABLE A-5

Weighted Average Prices and Aggregate Quantities of "Large" and "Small" Eggs Sold, by 28-Day Periods San Francisco Bay Area

28-day				
period	P _T .	P _S b/	Q_C	Q54
ending		*S		S
	cents p	er dozen	million	dozens
1952 May 24 June 21 July 19 August 16 September 13 October 11 November 8 December 6	50.8 51.5 62.1 69.0 72.0 73.9 73.7 69.8	44.1 41.8 51.7 56.6 55.2 53.4 54.5 56.2	1.735 1.638 1.519 1.479 1.276 1.281 1.393 1.601	.407 .459 .515 .551 .769 .859 .878
1953 January 3 January 31 February 28 March 28 April 25 May 23 June 20 July 18 August 15 September 12 October 10 November 7 December 5	68.3 62.7 54.9 58.7 61.3 62.0 61.8 67.5 73.6 77.0	63.0 57.4 48.1 53.4 56.4 56.9 54.3 57.4 57.9 57.0 56.6	1.698 1.953 1.833 1.773 1.830 1.661 1.703 1.553 1.409 1.299 1.207	.616 .518 .453 .430 .498 .428 .440 .554 .701 .724 1.022
January 2 January 30 February 27 March 27 April 24 May 22 June 19 July 17 August 14 September 11 October 9 November 6 December 4	69.4 63.0 57.8 51.0 48.7 48.9 50.7 58.8 60.6 60.2 58.1 50.8 52.5	60.6 56.9 53.1 43.6 42.1 40.6 39.0 45.7 43.2 39.4 33.8 37.6 38.0	1.422 1.593 1.621 1.670 1.687 1.582 1.530 1.330 1.281 1.250 1.231 1.335 1.364	.559 .524 .379 .409 .448 .430 .466 .501 .615 .684 .858 .793 .788

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	7.00.0 2.00.0	6.00 9.00 1.00 2.00 2.00 7.00 4.00 7.00 4.00 7.00		Control of the second of the s

28-day period ending	P _L a/	P _S b/	o ^r c∖	Q _S <u>d</u> /
	cents p	er dozen	million	dozens
January 1 January 29 February 26 March 26 April 23 May 21 June 18 July 16 August 13 September 10 October 8 November 5 December 3 December 31	47.6 51.2 55.7 52.1 49.0 49.1 50.6 51.7 54.6 60.7 66.2 58.8 57.9 64.7	41.5 46.3 51.2 48.2 44.0 43.3 42.2 44.7 47.4 50.4 45.6 47.2 60.8	1.710 1.622 1.602 1.623 1.763 1.652 1.491 1.474 1.362 1.279 1.222 1.398 1.466 1.665	.558 .459 .393 .381 .445 .409 .407 .448 .526 .645 .732 .655 .472

- a/ The weighted average price of large eggs was obtained from the data listed in Appendix Table A-1 by using the sales of Large AA and Large A eggs as weights applied to the corresponding prices.
- b/ The weighted average price of small eggs was obtained from the data listed in Appendix Table A-1 by using the sales of Medium A and Small A as weights applied to the corresponding prices.
- c/ Aggregate sales of Large AA and Large A eggs. Based on data in Appendix Table A-1.
- d/ Aggregate sales of Medium A and Small A eggs. Based on data in Appendix Table A-1.
- e/ Dashes indicate no data available.

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APPENDIX TABLE A-6
Data Used in Regression Analyses

28-day period ending	Ta/	P _L b/	P _S b/	Q_C/	Qs, t+l	y₫/	P _C
		cents pe	r dozen		of eggs capita	dollars per capita	cents per dozen
1952 May 24 June 21 July 19 August 16 September 13 October 11 November 8 December 6	1 2 3 4 56 7 8	50.8 51.5 62.1 69.0 72.0 73.9 73.7 69.8	44.1 41.8 51.7 56.6 55.2 53.4 54.5 56.2	.760 .715 .661 .642 .553 .554 .601	.200 .224 .239 .333 .371 .379 .357 .265	160 160 166 166 166 180 180 180	36.4 39.3 48.4 55.3 56.9 59.0 61.4 54.5
1953 January 3 January 31 February 28 March 28 April 25 May 23 June 20 July 18 August 15 September 12 October 10 November 7 December 5	9 10 11 12 13 14 15 16 17 18	68.3 62.7 54.9 58.7 61.3 62.0 61.8 67.5 73.6 77.0	63.0 57.4 48.1 53.4 56.4 56.9 54.3 57.4 57.9 57.0	.729 .839 .786 .758 .781 .708 .724 .659 .597 .549	.223 .194 .184 .213 .182 .187 .235 .297 .306 .431	164 164 164 168 168 168 170 170	48.6 45.4 44.3 49.5 49.7 48.8 50.4 52.9 56.7

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Appendix Table A-6 continued.

28-day period ending	Ta/	P _L b/	P _S b/	Q _L c/	Q _S , t+1	Y <u>ā</u> √	P _C
CHULLIS					of eggs	dollars	cents
		cents p	er dozen	per	capita	per capita	per dozen
January 2 January 30 February 27 March 27 April 24 May 22 June 19 July 17 August 14 September 11 October 9 November 6 December 4	22 23 24 25 26 27 28 29 30 31 32 33 34	69.4 63.0 57.8 51.0 48.7 48.9 50.7 58.8 60.6 60.2 58.1 50.8 52.5	60.6 56.9 53.1 43.6 42.1 40.6 39.0 45.7 43.2 39.4 33.8 37.6 38.0	.597 .669 .680 .699 .705 .660 .638 .553 .532 .519 .510	.220 .159 .171 .187 .179 .194 .208 .391 .284 .356 .328 .326	161 161 161 161 161 161 164 164 164 174 174	47.8 47.2 45.1 40.5 38.4 36.0 35.2 39.2 41.8 42.6 43.2 40.3 37.2
1955 January 1 January 29 February 26 March 26 April 23 May 21 June 18 July 16 August 13 September 10 October 8 November 5 December 3	35 36 37 38 39 40 41 42 43 44 45 46	47.6 51.2 55.7 52.1 49.0 49.1 50.6 51.7 54.6 60.7 66.2 58.8 57.9	41.5 46.3 51.2 48.2 44.0 43.3 43.3 42.2 44.7 47.4 50.4 45.6 47.2	.706 .669 .660 .668 .725 .678 .612 .604 .558 .523 .499 .570	.189 .162 .157 .183 .168 .167 .184 .215 .264 .319 .299 .267	167 167 167 167 173 173 173 176 176 176 176	31.8 33.4 41.5 41.1 37.9 35.3 36.1 37.0 41.4 48.2 50.8 49.6 50.2

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Appendix Table A-6 continued.

- a/ Time, measured in 28-day periods.
- b/ See Appendix Table A-5.
- c/ Monthly estimates of San Francisco Bay area population were obtained by linear interpolation between the estimates given in Appendix Table A-3. Egg sales from Appendix Table A-5 were divided by corresponding population estimates to obtain estimates of per-capita sales.
- d/ California personal income by quarters in Appendix Table A-2 was divided by 3 to obtain a rough measure of monthly income. This was further divided by the corresponding estimate of California population obtained by linear interpolation with the estimates from Appendix Table A-3.
- e/ Dashes indicate no data available.

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APPENDIX TABLE A-7
Summary of Regression Equations

Regression	Dependent	Constant			Indepe	endent vari	ables a/			Adjusted multiple
equation	variable	term	P _{Lt}	P _{St}	Q _{Lt}	Pct	Q _S , t+1	Yt	Tt	correlation coefficient
(1)	P _{Lt}	14.476				0.991 (16.547)				•931
(2)	P _{St}	2.639	1.050 (15.925)b/				-65.394 (8.934)			.925
(3)	Q _{Lt}	.837	-0.013 (11.726)	0.011 (9.498)				0.000748	-0.00346 (6.806)	.913
(3*)	Q _{Lt}	.944	-0.013 (13.043)	+0.011 (9.588)					-0.00329 (7.479)	.914

a/ PLt = local price of large eggs at time, t.

P_{St} = local price of small eggs at time, t.

 $Q_{T,t}$ = local per-capita sales of large eggs at time, t.

P_{Ct} = Chicago price of large eggs at time, t.

Q_{S, t+1} = local per-capita sales of small eggs at time, t+1.

 Y_{t} = local per-capita income at time, t.

 T_t = index of time, T_1 = 1 for the 28-day period ending on May 24, 1952.

b/ Figures in parentheses below the regression coefficients are associated observed values of the t random variable.

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APPENDIX TABLE A-8

Ratios of Prices of Large A, Medium A, and Small A Eggs to Large AA Egg Prices San Francisco Bay Area, 1952-1955

28-day period ending	P _{LA}	P _{MA} P _{LAA}	P _{SA} P _{LAA}
1952 May 24 June 21 July 19 August 16 September 13 October 11 November 8 December 6	.942 .950 .949 .949 .928 .923 .965	.880 .845 .887 .874 .805 .789 .816	.667 .582 .595 .634 .578 .507 .532 .671
January 3 January 3 January 31 February 28 March 28 April 25 May 23 June 20 July 18 August 15 September 12 October 10 November 7 December 5	.962 .951 .964 .965 .968 .968 .951 .922 .930 .939 .917	.925 .915 .883 .923 .929 .922 .887 .868 .845 .841 .761 .794	.789 .813 .749 .802 .803 .765 .691 .647 .594 .541 .526 .633
January 2 January 30 February 27 March 27 April 24 May 22 June 19 July 17 August 14 September 11 October 9 November 6 December 4	.916 .942 .972 .934 .957 .915 .889 .853 .864 .925 .895	.875 .904 .929 .872 .880 .841 .779 .784 .730 .703 .614 .667	.730 .810 .807 .731 .752 .630 .576 .496 .482 .451 .411 .501 .613

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Appendix Table A-8 continued.

28-day period ending	P _{LA} P _{LAA}	P _{MA} P _{LAA}	P _{SA} P _{LAA}
January 1 January 29 February 26 March 26 April 23 May 21 June 18 July 16 August 13 September 10 October 8 November 5 December 31	.958 .938 .963 .960 .947 .947 .869 .923 .908 .927 .920 .959 .969	.879 .904 .922 .930 .903 .894 .848 .830 .827 .797 .803 .794 .831	.752 .790 .811 .821 .802 .732 .694 .688 .604 .551 .535 .618 .654

Source: See Appendix Table A-1.

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APPENDIX TABLE A-9

Ratios of the Sales of Large A, Medium A, and Small A Eggs to Large AA Sales San Francisco Bay Area, 1952-1955

28-day	Q _{LA}	Q _{MA}	Q _{SA}
period	Q _{IAA}	Q _{LAA}	Q _{LAA}
ending	LAA	LAA	LAA
1952 May 24 June 21 July 19 August 16 September 13 October 11 November 8 December 6	.430 .378 .384 .402 .329 .326 .308 .350	.292 .313 .359 .377 .612 .638 .585	.0435 .0735 .1016 .1455 .1840 .2515 .2399 .0957
1953 January 3 January 31 February 28 March 28 April 25 May 23 June 20 July 18 August 15 September 12 October 10 November 7 December 5	.408 .396 .359 .334 .378 .380 .376 .533 .525 .545 .444 .349 .304	.463 .335 .299 .284 .329 .326 .319 .442 .526 .527 .890 .722 .514	.0473 .0420 .0368 .0392 .0466 .0303 .0375 .1043 .2332 .3339 .3325 .1614 .0868
January 2 January 30 February 27 March 27 April 24 May 22 June 19 July 17 August 14 September 11 October 9 November 6 December 4	•357 •328 •247 •268 •240 •246 •303 •459 •320 •270 •231 •197	.455 .383 .253 .270 .273 .301 .352 .467 .526 .534 .673 .589	.0781 .0545 .0388 .0400 .0569 .0617 .0535 .0824 .1067 .1618 .1846 .1238

APPENDIX TABLE A-9

Ratios of the Sales of large A, Medium A, and Small A Eggs to Large AA Sales San Francisco Bsy Area, 1952-1955

Ae ^Q	ALC.	AIG	vsb-69
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0181.	217).	ese.	September 13
2515	859.	326.	October 11
6668	385.	. 308.	November 6
7500.	595.	.350	December 6
			1953
£140.	691.	804.	January 3
0940.	-335	.396	Jamesry 31
8320.	.299	.359	February 28 -
S880.	485.	+334	Harch 28
9940.	ese.	.378	April 25
.0303	386.	088.	May 23
- 6375	616	-376	June 20
£401.	S44,	-533	July 18
2338	326	525	August 15
-8339	732	242.	September 12
Cage.	098.	title.	October 10
1797	357	.349	Wovember 7
8380.	416.	304	December 5
			1954
Leyo.	.455	357	January 2
5450	.383	892.	January 30
.0388	.253	TIS.	Rebrussy 27
0040.	075.	889.	Maych 27
6950*	273	0//\$.	April 24
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7530.	.352	.303	June 19
458a.	1941	651	July 17
7301.	326	.320	August 14
9191.	452.	-270	September 11
348E.	673. 589.	183.	October 9
8291.	288	.197	Hovember 6
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Appendix Table A-9 continued.

28-day period ending	Q _{LA}	Q _{MA} Q _{LAA}	Q _{SA} Q _{LAA}
1955 January 1 January 29 February 26 March 26 April 23 May 21 June 18 July 16 August 13 September 10 October 8 November 5 December 3 December 31	.145 .247 .326 .231 .202 .183 .245 .198 .251 .215 .203 .178 .144 .175	.338 .316 .293 .262 .267 .266 .311 .323 .434 .541 .619 .533 .459 .302	.0347 .0371 .0325 .0271 .0360 .0265 .0293 .0404 .0491 .0713 .1487 .0833 .0522

Source: See Appendix Table A-1.

Appendix Table A-9 continued.

AAI ^O	AAIR	AAI ⁰	28-day period ending
.0347 .0371 .0325 .0255 .0265 .0265 .0404 .0404 .0404 .0404 .0404 .0404 .0522	.338 .269 .269 .269 .269 .424 .428 .428 .433 .308	.145 .247 .326 .221 .202 .245 .198 .215 .215 .215 .215	1955 Jenuary 1 Jenuary 29 February 26 Merch 26 April 23 April 23 June 18 June 18 August 13 August 13 October 6 December 3 December 31

Source: See Appendix Table A-1.